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TUBERCULOSIS AMONG THE EX-SERVICE MEN.

WITH SPECIAL REFERENCE TO ITS BEARING ON PUBLIC HEALTH.¹

By HUGH S. CUMMING, Surgeon General, United States Public Health Service.

A general impression apparently prevails among the laity that the incidence of tuberculosis was greatly increased in the United States by the World War. It is not surprising that this idea is current. Care of the disabled has naturally been a matter of general solicitude. Difficulties encountered in providing sanatorium treatment were given wide publicity and sometimes were exaggerated. Moreover, the appalling increase in tuberculosis which occurred during the war in most countries of Europe, and which still prevails in Austria and Russia, has become common knowledge. Among all those nations, including some nonbelligerents, whose food supplies were seriously affected and who felt keenly the stress of war and its results, tuberculosis increased, indeed, to an alarming extent. It is natural, therefore, although this country was fortunately spared the pinch of famine, the desolation of invasion, and many of the fears, griefs, deprivations, and other forms of stress which try the spirit, waste the body, and, therefore, pre dispose to tuberculosis, that our citizenry should anticipate an increase of tuberculosis here and, in the same pride with which they demanded a place in the fighting line, count their casualties in kind.

It may be recalled that in 1919, when making a forecast of hospital needs, it was estimated by the Public Health Service that approximately 12,000 beds would be required within two years for tuberculous veterans. It is also a fact that by the end of April, 1922, there were 11,346 tuberculous veterans hospitalized at Government expense in the United States, as well as considerable numbers receiving compensation for that disability who declined hospital care. The incidence of tuberculosis was, however, only slightly increased in the United States during the war, either among males

¹ Read before the section on preventive and industrial medicine and public health at the Seventy-Third Annual Session of the American Medical Association, St. Louis, May, 1922, and printed in the *Journal of the American Medical Association*, vol. 79, No. 5, July 23, 1922, pp. 370-374.

of military age or any other class of population. The forecast of hospital needs referred to above, which has proved to be approximately correct, was made merely in accordance with the known incidence of tuberculosis among the general population in the age groups concerned. A glance at the curve (Fig. 1) shows how sensitive the tuberculosis mortality is to collateral influences. The slight but perceptible rise in 1916 and 1917 is presumably due to the increase in living costs or perhaps, more exactly, the degree to which this increase exceeded that in wages or other rewards for production. To these causes must be added in 1918 that of the epidemic of influenza. There seems little doubt that these increases were not related to actual participation in the war.

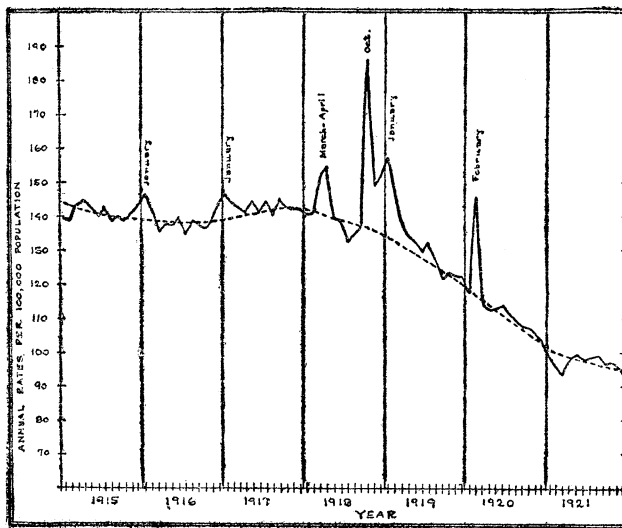


FIG. 1.—Recent decline in mortality from all forms of tuberculosis. Monthly rates from 1915 to 1921 in 24 States (in 1921, provisional data for only 15 States were available), with normal seasonal variation eliminated.

The curve (Fig. 2) comparing the mortality rates of 1915 and 1920, shows a marked postwar decline in tuberculosis mortality which is even more marked among males, including those of military age, than among females. It is, I think, generally accepted that the incidence of tuberculosis in any country, in both sexes and at every age except infancy and childhood alone, reflects with great precision the living and industrial conditions prevailing. It is therefore not strange that tuberculosis was not increased among our troops, who were generally well fed, well housed, and well clothed, or, except to a very slight degree, among the population as a whole.

The war risk insurance act of October 6, 1917, promised hospital care to disabled veterans, but made no provisions for the construc-

tion or operation of hospitals, nor did it name the agency whereby the proposed care was to be provided. It was, of course, impossible to reckon at that time with the desire which manifested itself, as soon as the armistice was signed, for discharge from military and

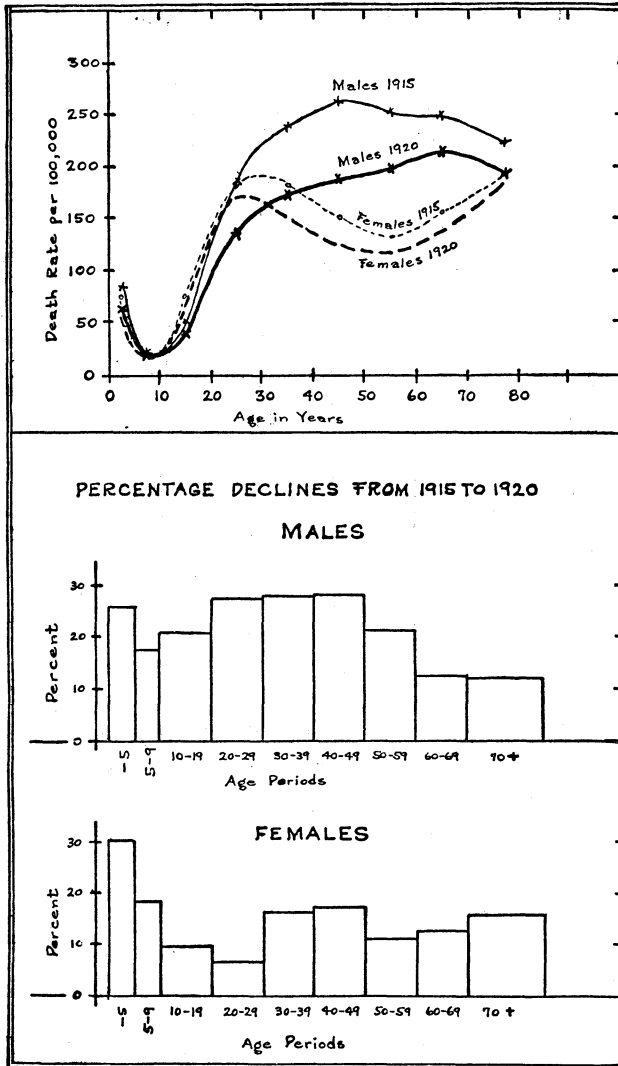


FIG. 2.—Specific death rates for all forms of tuberculosis in twenty-four registration States compared for 1915 and 1920.

naval service. This prevented extensive use of military and naval hospitals for discharged men, who usually evidenced a distaste for all things connected with military life. It was a perfectly natural reaction, considering the psychology of the situation, and one which

in no way reflects upon the excellent treatment provided by the Navy and Army hospitals.

TABLE I.—*Mortality from tuberculosis in the United States, 1915 and 1920.*¹

Age period (years).	Death rate per 100,000.				Per cent decrease in mortality in 1920 over 1915.	
	Males.		Females.			
	1915	1920	1915	1920	Males.	Females.
All forms:						
All ages.....	156.1	117.2	124.4	107.8	24.9	13.3
Under 5.....	84.5	62.5	77.2	53.9	26.2	30.2
5-9.....	22.6	18.6	22.9	18.7	17.7	18.3
10-19.....	49.6	39.3	76.1	68.9	20.8	9.5
20-29.....	186.3	134.5	184.3	172.2	27.8	6.6
30-39.....	240.7	173.0	183.1	153.2	28.1	16.3
40-49.....	263.9	189.0	152.4	125.6	28.4	17.6
50-59.....	252.9	198.2	134.1	119.3	21.6	11.0
60-69.....	248.4	216.6	158.7	138.7	12.8	12.6
70 and over.....	220.2	193.5	198.4	162.8	12.1	15.8
Pulmonary tuberculosis:						
All ages.....	136.0	102.9	107.5	94.1	24.3	12.5
Under 5.....	25.8	21.2	25.7	18.2	17.8	29.2
5-9.....	7.9	7.0	9.9	8.9	11.4	10.1
10-19.....	40.3	31.6	66.8	60.2	21.6	9.9
20-29.....	171.2	124.6	171.8	160.8	27.2	6.4
30-39.....	225.1	162.6	169.9	143.2	27.8	15.7
40-49.....	245.1	177.1	140.2	113.9	27.7	18.7
50-59.....	234.1	184.1	120.4	106.9	21.4	11.2
60-69.....	226.1	199.5	141.7	125.3	11.8	11.6
70 and over.....	196.3	177.8	173.9	141.5	9.4	18.6

¹ Specific death rates per hundred thousand for males and females compared for 1915 and 1920 in 24 registration States, with percentages of decrease; on revised intercensal population estimates for July 1, 1915, and July 1, 1920, but using the 1915 sex and age distribution. The 24 States are those constituting the death registration area in 1915. Acknowledgments are made to Dr. W. H. Davis, chief statistician for vital statistics, Bureau of the Census, for the use of mortality data from original tabulation sheets.

It was not, therefore, until March 3, 1919, that by act of Congress the Public Health Service was named as the principal agency whereby hospital and medical care was to be provided. The emergency was serious. To place a properly trained physician in each city or large town in all parts of the United States, to find hospital beds for the widely scattered disabled veterans who applied for examination and treatment in all parts of the United States, and to equip, man, and operate such institutions in various parts of the country as could be converted to hospital use—these were some of the urgent problems that arose. The tuberculosis patients caused considerable concern, and it was early apparent that emergency hospital provision was at once necessary. Congress in failing to act favorably on the recommendations contained in House Document No. 481, which was transmitted by the Secretary of the Treasury, December 8, 1919, reflected the idea, not wholly extinct among medical men, that permanent hospitals are not necessary for the treatment of tuberculosis. The estimates made in House Document No. 481 provided for the construction, among other institutions, of 19 hospitals for tuberculosis, with an aggregate capacity of 9,330 beds, at an approximate cost of \$32,500,000. This was for tuberculosis hospitals alone. The

plan contemplated the construction of permanent institutions located near the centers of population to be served. It visioned ample grounds, with lawns and trees, and restful environments in salubrious but not isolated places. Unfortunately, however, the treatment of tuberculosis became associated in its early history with the tent, the shack, the lean-to, with life in the open under primitive conditions. The early advice, "Go West and rough it," was recalled. It was necessary to explain again and again that a tuberculous patient needs highly specialized care, calling for modern hospital facilities. It was necessary for this conviction to find place gradually, and for public sentiment to lead the way to the necessary appropriations.

As an evidence of the difficulties encountered at one critical period, it may be mentioned that on December 24, 1919, the President approved the amendment to the war risk insurance act which increased the allowance for total temporary disability from \$30 to \$80 a month. On the same day, in anticipation of an increased number of claimants, the Public Health Service solicited the assistance of the American Legion to find additional hospital accommodations for tuberculous patients, believing that the criticism which the Government was at that time facing might be in part ameliorated or its cause mitigated by concerted effort of the comrades of those needing treatment, to find hospitals suitable for their care. The Legion in response sent out requests from its headquarters to posts in all parts of the United States, and its members cooperated with our field officers to the desired end. A glance at Figure 4 will show the extent to which contract hospitals were utilized in this very trying period. We are all familiar with the criticisms which arose concerning their use. I have no apologies to make. The institutions were representative of the medical care prevailing in the respective communities at that time. Some of the institutions were excellent; others were unsuitable and were abandoned as rapidly as their unsatisfactory condition was determined by the district inspectors detailed for the duty. Whether it would have been better for the Federal Government to arrange with State sanatoriums and those operated by other political units for the care of all tuberculous patients in this manner is open to question. The plan had many advocates among members of the National Tuberculosis Association. A plan whereby such hospitals might have been enlarged by Federal funds for tuberculous veterans was foredoomed to failure because of the distaste evidenced on every hand to the admission of veterans to any hospital which cared for free patients, or, according to the vernacular, "charity patients." Objections were made to the use of State sanatoriums, county sanatoriums, and such excellent institutions as Oak Forest in Chicago, Seaview Hospital in New York City, and the Branch Hospital in Cincinnati. There appeared, therefore, no choice but to proceed with the development

of temporary hospitals for which some funds were provided, which funds, however, according to the law, could not be used for permanent construction.

The character of the temporary Army hospitals of the cantonment type is too well known to merit a description. The widely separated, one-story wards, the connecting corridors with numerous inclines, the numerous heating units, the fire risks, the difficulty of supplying hot food, are well known. The sagging foundations, warped floors, and leaky roofs of these temporary buildings were eloquent allies at a time when it was necessary to plead for new hospitals. Some of the attacks made upon the Government, notably in the case of

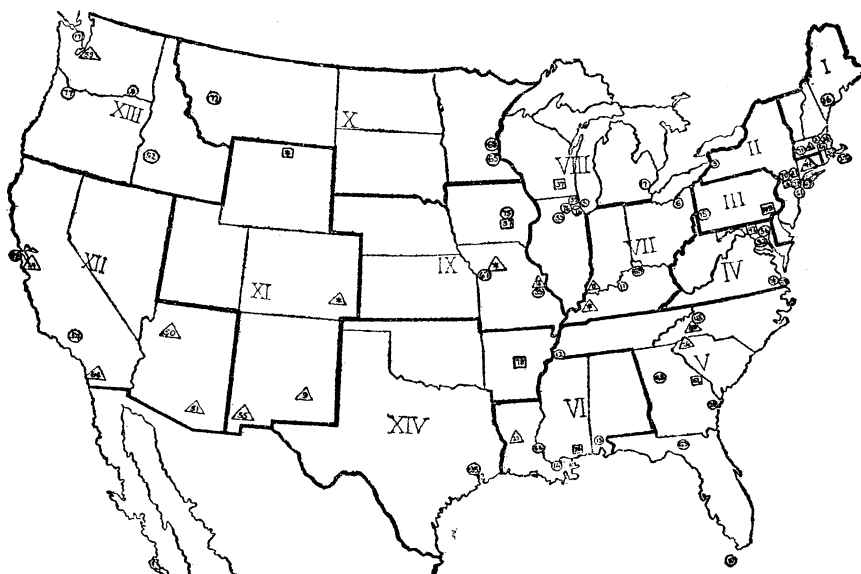


FIG. 3.—Location of United States Public Health Service Hospitals, January, 1922: Circles indicate general hospitals; triangles, tuberculosis hospitals; squares, neuropsychiatric hospitals, the numbers being definitely located in Table 3.

the Fox Hills Hospital, were, possibly, not wholly devoid of a well-meant but ill-advised effort to force the appropriation of necessary funds to build permanent institutions.

The tuberculosis hospitals taken over from the Army, in addition to those at Markleton, Pa., and Deming, N. Mex., which were abandoned as unsatisfactory as soon as more suitable hospitals had been obtained, were:

- No. 24, Palo Alto, Calif., 650 beds.
- No. 26, Greenville, S. C., 700 beds.
- No. 27, Alexandria, La., 600 beds.
- No. 41, New Haven, Conn., 500 beds.
- No. 50, Prescott, Ariz., 765 beds.
- No. 55, Fort Bayard, N. Mex., 1,120 beds.
- No. 60, Oteen, N. C., 1,100 beds.
- No. 64, Camp Kearney, Calif., 550 beds.

To supplement these, a temporary hospital of 290 beds, intended chiefly for winter use, was established at Tucson, Ariz., at Pastime Park, cottages built from salvaged lumber supplementing the existing buildings. The abandoned Indian school at Tacoma, Wash., was also converted into a temporary hospital of 278 beds. One of the difficulties in operating hospitals of this group was the lack of quarters for personnel. The Public Health Service has a corps of commissioned officers, but lacks an enlisted personnel. Its employees are all civilians who may leave at will and whose contentment is often conditioned on the presence of their families, of schools, social advantages, and other refinements of living not demanded or expected under military conditions. From the patients' point of view it must also be admitted that the gloomy outlook afforded by the war-time buildings, now 4 years old, is depressing.

From the beginning of the work by the Public Health Service the hospitalization and the transfer of patients was, so far as possible, decentralized. A disabled soldier coming under observation at any point in the field and found to be in need of hospital care was immediately offered it, if not in a hospital operated by the Government, then in the best contract hospital available. According to a custom which has prevailed in the Public Health Service for more than a hundred years, tuberculous patients are routinely admitted as a temporary measure to any of its general medical and surgical hospitals. The tuberculosis wards in our hospitals in Boston, New York, Baltimore, Chicago, and other large cities, which were important clearing stations, often contained several hundred patients each. The tuberculous patients at Fox Hills, indeed, sometimes outnumbered all others. The resolution which the American Medical Association adopted at the Boston session last year, advocating this practice for civil hospitals, has served to disarm unjust criticism and to strengthen the Government in a useful practice. Your action, therefore, wisely taken in the general interests of public health everywhere, has served the Government in a trying administrative problem.

The demand for climatic change was another heritage from an earlier generation. Tuberculous patients and their friends demanded a transfer to special climates from northern, southern, eastern, western and central portions of the United States. The spirit of restlessness engendered by the war was manifest. As a further evidence of this, a popular report is current that 25,000 tuberculous ex-soldiers are found to have migrated to Colorado alone, only 2 per cent of the hospital patients coming under observation in that State being natives of Colorado. It was necessary to refuse many unwise requests for the removal of tuberculous patients, unsuited by reasons of physical condition, from hospitals where they were under treatment to other

hospitals in the arid Southwest. So far as I am aware, however, there are no instances in which a sick man in any part of the United States was not provided with, or at least offered, hospital care, of the standard prevailing in that community, without more than a few days' delay. The most insistent demands were made for the transfer of terminal cases. "Give this dying man a chance" was a frequent expression typical of the character of requests daily received. It was exceedingly difficult and sometimes futile to attempt to explain that the importance thus attributed to climatic influence is out of harmony with modern scientific thought, nor was the problem rendered easier by the fact that large numbers of reputable physicians throughout the country appeared to entertain views long since believed obsolete.

The hospitals devoted to the care of veterans were manned almost exclusively by personnel from the military and naval forces. Medical

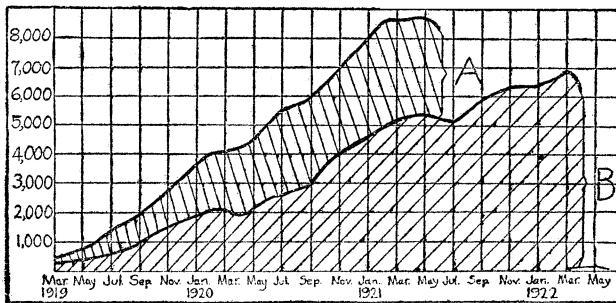


Fig. 4.—Hospital care of tuberculous veterans of the World War, U. S. Public Health Service, March, 1919, to June, 1922; patients in Army, Navy, and soldiers' home hospitals not included. A, contract and other institutions; responsibility and control transferred to the U. S. Veterans' Bureau, June, 1921. B, Public Health Service hospitals; administration of veterans' hospitals transferred to U. S. Veterans' Bureau by Executive order, April 29, 1922.

officers, nurses, reconstruction aides, dietitians, and laboratory technicians were almost without exception with military experience, many of them having served overseas. All, therefore, were well prepared to sympathize fully with the needs of their patients. The American Legion is well represented in membership among both patients and personnel, and at some of the hospitals the local post constitutes the largest in the community, and sometimes the largest in the State.

It need cause no surprise that special training in tuberculosis for officers was necessary. The lack of adequate instruction in this specialty in most medical schools is well known, while the exclusion of tuberculosis patients from general hospitals, a still all too common custom, and the practice of sending tuberculous patients "away" have combined to alienate the average physician from a knowledge of tuberculosis. The excellent Army schools in tuberculosis which

were conducted under the auspices of Col. George E. Bushnell, retired, had trained a considerable number of Army medical officers, some of whom continued on duty with the Public Health Service. With these and a few other skilled men as a nucleus, the training of a sufficient number of medical officers was undertaken to provide proper care for patients in hospitals. A summer school was conducted at Oteen, and numerous short courses in diagnosis were held at various places, every tuberculosis hospital being required to give its medical personnel a prescribed course in training which, during the last three years, has naturally been applied to a considerable number of medical officers stationed therein or assigned for the purpose. Doctor Palmer, who, together with Doctor Boswell, has consented to discuss my subject, is one of the five experts who were engaged to visit our tuberculosis hospitals to assist in establishing a suitable standard of treatment and to strengthen weak points. Since he visited more hospitals and visited them oftener than the others, he is perhaps better qualified than any other person to tell impartially, just as he told me in his official reports, the facts about the hospitals as he found them.

TABLE II.—*Hospital activities of Public Health Service*

Veterans admitted to hospital.....	264, 000
Hospital relief days.....	14, 397, 500
Outpatient (dispensary) treatments.....	2, 042, 200
Physical examinations.....	1, 459, 200

NOTE.—The normal hospital operations of the Public Health Service, in providing relief for merchant seamen and its other beneficiaries in the 25 marine hospitals still remaining, amounted last year (one year only) to the following:

Old line patients admitted to hospital.....	44, 756
Hospital relief days.....	1, 121, 171
Physical examinations.....	79, 759

It is not possible to tabulate the tuberculosis patients with respect to the stage of disease in which they were admitted, these figures not being available at the present time. Many were admitted with doubtful diagnosis, claiming compensation for and giving a history of symptoms which indicated tuberculosis. Some of these had been exposed to war gases or were convalescent from epidemic pneumonia. In all, approximately 65,000 veterans were admitted to hospitals, including both Government and civil institutions, up to May 1 of this year. It early became necessary to differentiate between patients having tuberculosis for which they required treatment and those with healed or quiescent tuberculosis which did not require hospital care. Numbers of patients were discharged within a few weeks after admission, a board of properly qualified medical officers having determined that they were nontuberculous, in a clinical sense.

TABLE 3.—*Location of United States Public Health Service Hospitals.*

No.	No.
2. Boston.	49. Philadelphia.
3. Buffalo.	50. Prescott, Ariz.
5. Chicago.	51. Tucson, Ariz.
6. Cleveland.	52. Boise, Idaho.
7. Detroit.	53. Dwight, Ill.
8. Evansville, Ind.	54. Arrowhead Springs, Calif.
9. Fort Stanton, N. Mex.	55. Fort Bayard, N. Mex.
10. Key West, Fla.	56. Baltimore.
11. Louisville, Ky.	57. Knoxville, Iowa.
12. Memphis, Tenn.	59. Tacoma, Wash.
13. Mobile, Ala.	60. Oteen, N. C.
14. New Orleans.	61. Staten Island, N. Y.
15. Pittsburgh.	62. Augusta, Ga.
16. Portland, Me.	63. Lake City, Fla.
17. Port Townsend, Wash.	64. Camp Kearney, Calif.
18. St. Louis.	65. St. Paul.
19. San Francisco.	66. Carville, La.
20. Savannah, Ga.	67. Kansas City, Mo.
21. Stapleton, N. Y.	68. Minneapolis.
22. Vineyard Haven, Mass.	69. Fort Thomas, Ky.
24. Palo Alto, Calif.	70. New York.
25. Houston, Tex.	71. Sterling Junction, Mass.
26. Greenville, S. C.	72. Helena, Mont.
27. Alexandria, La.	73. Chicago.
29. Norfolk, Va.	74. Gulfport, Miss.
30. Chicago.	75. Colfax, Iowa.
32. Washington, D. C.	76. Maywood, Ill.
34. East Norfolk, Mass.	77. Portland, Oreg.
35. St. Louis.	78. North Little Rock, Ark.
36. Boston.	*. Sheridan, Wyo.
37. Waukesha, Wis.	*. Dawson Springs, Ky.
38. New York.	*. Walla Walla, Wash.
41. New Haven, Conn.	*. Excelsior Springs, Mo.
42. Perryville, Md.	*. Las Animas, Colo.
43. Ellis Island, N. Y.	*. (Bronx) New York.
44. West Roxbury, Mass.	*. Norfolk, Va.
45. Biltmore, N. C.	*. Rutland, Mass.
48. Atlanta, Ga.	

*The asterisks and the numbers are reproduced on the map (Fig. 3).

While final statistics have not been published, the general impression prevails that war gases were not an important cause of clinical tuberculosis. In this connection, the following observation made by the Surgeon General of the Army in a recent report is pertinent:

In the year 1918 there were one and one-half times as many cases of tuberculosis per thousand among all troops in France as there were among those gassed, and in 1919 there were more than one and three-fourths times as many tuberculosis cases per thousand among all troops as there were among the gassed troops.

The mental attitude of patients is indicated in some measure by the fact that out of 9,200 patients discharged from service hospitals between July 1, 1921, and May 1, 1922, 3,132, or more than one-third, left against advice and without permission, treatment not having been completed. Those discharged for disciplinary reasons during the same period numbered 189. Many of these patients, presumably, sought readmission to other hospitals in accordance with the spirit of unrest which still prevails, although to a less degree than formerly, among ex-service men. The frequency of departures from the hospital against medical advice has been ascribed in part by experienced hospital executives to the custom whereby the Veterans' Bureau provides transportation home for those so departing for the first time. Homesick men, at some distance from their friends, and finding sanatorium regimen irksome, are tempted to take advantage of this opportunity to return to their families. Men also who have at their own expense unwisely sought climatic treatment at distant places may enter the nearest Government hospital, even for the express purpose of claiming transportation home. It is somewhat significant that the small temporary hospital at Tucson, Ariz., with a capacity of less than 300 beds, discharged 488 against advice between March 15, 1920, and April 23, 1922, which is more than half of its total discharges during that period. This hospital is one to which, with few exceptions, no transfers are made by the Government, as it is merely an emergency hospital for ex-service men found in Tucson in need of medical care.

Special treatments, including induced pneumothorax, heliotherapy, both natural and artificial, occupational therapy, including physiotherapy, and vocational training as applied therapeutic exercise, were encouraged in all the tuberculosis hospitals. Some of the best results in tuberculous laryngitis were obtained at hospitals in the arid Southwest, with sunlight and silence. Some research work related to the presence of small pneumothorax as a common but hitherto unrecognized accompaniment of active pulmonary tuberculosis was carried out at New Haven by Surgeons Barlow and Thompson, the results of which will shortly be published as a bulletin of the Hygienic Laboratory. The number of cases of bone and joint tuberculosis coming under observation has been rather surprising, approximately 3 per cent of tuberculous patients admitted to hospital having non-pulmonary disease. Of these, approximately two-thirds had involvement of the bones and joints.

Remembering that approximately one-third of all veteran hospital patients are the tuberculous, an idea of the operations relating to this class may be obtained from the summary of the total hospital activities of the Public Health Service during the three years since the work was undertaken, given in Table II.

The medical work which the Public Health Service was called on to perform for the Bureau of War Risk Insurance and its successor, the United States Veterans' Bureau, is now history. The field organization, including the 14 district supervisors' offices and their sub-agencies, reaching practically into every county of the United States, was turned over in June, 1921. The control of contract hospitals was relinquished also at that time. The Veterans' Bureau, having further perfected its organization, finally felt itself ready to assume the administration of the veterans' hospitals, which were, accordingly, turned over to Director Forbes by Executive order, May 29, 1922. This transfer consisted of 57 hospitals, with 17,500 beds, 13,057 patients (of whom 5,271 were tuberculous), and a personnel of 11,347, including 925 physicians and dentists, 1,425 nurses, 425 reconstruction aides, and 110 dietitians. I take this occasion to pay public tribute, before a body which has ever honored fidelity, to the professional men and women who, having been identified with the organization and operation of these hospitals for many months during very trying periods, were transferred from the Public Health Service to the Veterans' Bureau for continued duty of the same character. Their loyalty has been instant and unvarying, their patience untiring, their zeal unflagging, and their devotion unfailing, in the cause of the disabled veteran and the Government, whose obligations they strive to fulfill.

SEPARATION OF TOXIC AND NONTOXIC CELLS FROM CULTURES OF AN ANAEROBE ISOLATED FROM LARVÆ OF THE GREEN FLY.

By IDA A. BENGTSON, Assistant Bacteriologist, United States Public Health Service.

In attempting to obtain an unquestionably pure culture of the spore-forming anaerobe recently isolated from larvæ of a species of the green fly¹ the single cell method of Barber was employed.

The culture used was one developed from a well isolated single colony, fished from a deep liver-agar culture into meat medium, which consisted of one part of chopped meat and two parts of water, the whole adjusted to a reaction of p_H 8.0. This culture was toxic, causing the death of mice in about four hours, in a dose of 0.2 c. c.

A single cell (spore) culture derived from this culture was found to be nontoxic for mice, though the appearance of the growth in meat medium was identical with that of the growth previously obtained. Two other single cells (spores) were isolated; one was found to be toxic and the other nontoxic. These three cultures were designated *a*, *b*, *c*, *a* and *c* being nontoxic and *b* toxic.

¹Pub. Health. Rep., 1922, 37, 164-170. Reprint No. 726.